The Technology Commercialization Toolbox

The Technology Commercialization Toolbox is a resource guide and primer for individual inventors and companies who wish to turn their ideas into marketable products.

What can you find in the toolbox?

- How-to fact sheets
- Checklists samples and other tools
- Resource guide to technology experts
- Local or community expertise.
- Who should use the toolbox?

Inventors

- Small and medium-sized companies
- Technology Transfer Offices
- Foreign companies looking to locate in Canada.

Top ten tips for inventors:

1. Technology must be market driven.
2. Don't underestimate the time and resources required.
3. Assess your window of opportunity.
4. Recruit experienced management.
5. Look for experienced well connected investors.
6. Recruit an experienced board of Directors.
7. Assess ALL your commercialization options.
8. Recognize that inventors are often not suited to commercialize.
9. Take advantage of the commercialization infrastructure.
10. Network, Network, Network.

1.0 Sourcing Technology and Expertise

Canada has world-class experts that are ready to assist you in solving problems, improving products and processes, and exploiting new markets.

Whether your firm is looking to source technology in response to a (pressing) need, or to meet priorities identified in a strategic business or technology plan, there are numerous resources that can help you find what you are looking for quickly.

This section will provide you with information on where to find technologies, where to find research expertise, and where to find specialized facilities.

1.1 Where Do You Find Technologies?

Are you looking for new technologies?

Canadian universities and public sector labs have technology commercialization offices that keep current lists of technologies available for licensing and joint development.

New technologies can also be quickly located using the National Technology Index (NTI) — a searchable repository of technology commercialization opportunities.

The NTI offers an electronic alerting system, Opportunity Match, which will notify you monthly of the latest additions to the NTI.

To find out if there are patents in your technology area that may be available for licensing, sources such as a patent database, offered by the Canadian Intellectual Property Office (CIFO), can help.

Are you looking to develop a technology idea — to move from the concept stage to a developed technology product? There are private sector and government organizations that can help.

One of the premiere organizations in Canada is the Industrial Research Assistance Program (IRAP). Their network of more than 200 Industry Technology Advisors across Canada can help you find sources of assistance and commercialize your technology.

Other experts can be found in provincial research organizations and the Industry Liaison Offices (at universities). You can access comprehensive lists and databases of these groups in your area through the Toolbox's search mechanism.

1.2 How to Access Research Results

Research publications and journals

Accessing publications and journals that are relevant to your firm's activities can keep you up-to-date on technology trends. Many larger companies spend significant amounts of time monitoring the environment for cutting edge of research.

But, monitoring research journals requires time and money. If you don't have the resources, there are several options.

For example, you can search information sources like the National Expertise Index. University researchers will often list their scholarly publications here, which may be a quick way to find out what researchers are publishing and in which journals.

Another possibility is to use world-class information services such as the Canada Institute for Scientific and Technical Information (CISTI). CISTI provides abstracts over the internet at no-cost, and lets you access publications for a service fee.

CISTI also provides "alerting" services that let you know when articles in your area of interest have become available.

You can also access research journals through university libraries. Librarians at university libraries can do online searches to find relevant publications — usually for a small fee.

How to access research results directly?

If you have the means, you can access research results by providing grants-in-aid of research, which will help direct university research in areas that you may be interested in. You will not receive any proprietary rights over the results, but it will be an incentive for researchers to work in an area that you feel has commercial potential.

Consortia research organizations can leverage your research dollars by pooling resources with other firms and competitors to reach common objectives.

Consortia generally focus on research problems or pre-competitive research objectives that, as of yet, have no identified commercial potential.

Canada has a number of consortia-type arrangements, both nationally and internationally, in which your company may be able to participate.

1.3 Finding Research and Technical Expertise

Research expertise at Canadian universities

Looking for expertise? Canada's universities and affiliated research institutes host world-class experts in a broad range of fields.

You can locate experts through the National Expertise Index (NEI) — a database of some 15,000 researchers. In addition most universities have an expert's database that you can query, either by phone or through the internet.

A good place to start is the Office of Research Services, or in the case of larger universities, the Technology Transfer/University-Industry Liaison Office (U/ILO).

Once you have identified and determined a university researcher's interest and suitability, it's a good idea to find out about the institution's policy regarding consulting arrangements. Many universities list these policies on their websites.

In most cases, the university or research institute will insist that consulting work not involve resources already assigned to the researcher. In other words, that any consulting work not involve the use the institution's space, equipment, or the researcher's time during "working hours."

Research expertise in Canadian federal and provincial laboratories

Federal and provincial laboratories also have significant, world-recognized research expertise that can be made available to Canadian companies. The National Expertise Index database also contains thousands of public sector researchers and research centres.

Over the past several years, public labs have set up business development offices to handle contract research, technology transfer, and other activities to support private sector collaboration.

These offices will be able to assist you in doing business with a public lab. They may also be able to help you identify funding programs that can be used in any technology transfer activity undertaken.

Federal and provincial laboratories often have strict mandates, and may focus their technology transfer and collaborative activities to these mandated areas.

There may also be legislative restrictions with respect to the types of arrangement that can be made with industry. However, most federal labs have a strong interest in working with business, and will work to accommodate you.

1.4 Research Parks, Incubators and Community Colleges

Are you looking for physical space to conduct resarch; access to specialized equipment, or commercialization expertise? If so, you may want to consider locating in a research park.

These organizations typically provide furnished facilities and work stations to support research-based companies — either start-ups or established firms.

The research activity can range from pure to applied. It may include testing and analysis of materials and equipment, laboratory experiments, process development, and production or assembly of prototype products.

Many of these organizations also provide business mentorship support. This can include the preparation of business plans, comprehensive legal and financial advice, economic evaluation of projects, and business research.

Research parks and incubators, which are found in all of Canada's larger cities, are frequently located close to universities and major research facilities, so as to take advantage of their capabilities and equipment.

Need access to specialized scientific equipment?

Universities and public sector labs possess specialized scientific instrumentation and equipment that they are often willing to make available to industry. Access to specialized equipment, or the performance of a specific service, may be negotiated with the individual institution.

Many factors influence the availability of this arrangement, including the:

- Previous working relationship with the researcher and the institution.
- Provision of this service as a normal part of the institution's business practices.
- Availability of space and excess capacity for the equipment.
- Training of operators of the equipment.
- Institution's policy on these matters.

1.5 Training in Commercialization of Technology

Are you looking for training in technology to assist you in commercializing your technology?

Community colleges are an excellent source of customized training programs that can provide the expertise, and the facilities that training your firm needs.

A list of community colleges is available on the Association of Canadian Community Colleges Website.

Universities also provide courses and degree programs in Technology Management.

2.0 Acquiring Technology and Expertise

Acquiring a technology from an outside organization is becoming an increasingly common business practice.

Outsourcing from universities, government labs, and smaller firms can: reduce the time required to market a technology; reduce the costs of research; and defray the risks associated with developing new technologies.

Universities, public labs, and smaller firms are increasingly interested in commercializing the results of their research. Licensing their technologies allows them to: take advantage of established distribution channels; reduce the high costs of commercializing a technology themselves; and generate revenues.

What mechanisms can you use to acquire technology?

There are a variety of ways to obtain rights to a technology. These include:

- The outright purchase of the technology and/or the firm that owns it.
- The establishment of a joint venture to commercialize the technology.
- The establishment of a strategic alliance with the owner of the technology, with possible "cross-licensing," so that proprietary technologies are exchanged or "bartered."
- The negotiation of a license which gives exclusive rights to the technology, for a designated time period and in a designated area, typically in exchange for fees and/or royalties.
- The negotiation of a license which gives non-exclusive rights to the technology, for a designated time period and in a designated area, typically in exchange for fees and/or royalties.

Where do you start?

Once you have identified a technology as being of interest, you will want to seek further information. The holders of the technology should be able to provide you a non-confidential summary, references to any published material on the topic, or copies of issued patents.

As your evaluation of the technology continues, you will need to access confidential information, and will probably be asked to sign a Confidentiality Agreement.

If the evaluation process involves the transfer of biological materials, a Biological Material Transfer Agreement will be needed.

If you wish to reserve some level of exclusivity while evaluating a technology, an Option Agreement might be appropriate.

Before approaching an institution or company for an option or a licensing agreement, it is advantageous to know its Intellectual Property (IP) policy.

The IP policy can give you information about the needs (which often can be competing) of the research organization, the inventors, and any other party that may be involved in the negotiation.

In this section, the mechanisms used to acquire technology are briefly described. A number of templates and examples are provided for your assistance.

2.1 Licensing Agreements

A licensing agreement is a commonly used mechanism for acquiring technology from a firm, a university, or a government lab.

License agreements formalize the "right-to-use" of a technology (e.g., the intellectual property) from the researcher to the licensee.

Typically, you will be licensing a technology that falls under one or more patents, but you can also license a trade secret, know-how, trademark or, in the case of software, copyrighted material.

Different types of inventions lead to different licensing strategies: A basic scientific tool which could be used by everyone in the field might have a non-exclusive license, whereas an invention requiring extensive investment on your part may be licensed exclusively.

Most research institutions and firms that are interested in licensing their technology have developed a general licensing agreement that is modified as necessary for each invention and licensing situation. For universities, these are often available from the website or the Industry Liaison Office.

The license agreement represents the beginning of a long-term relationship. It is therefore important to negotiate an agreement that is fair and that satisfies all parties.

A license agreement must reflect the complete understanding the parties rights and obligations. It should use clear, easily understood terms, because licenses often stay in effect for many years and the original negotiators may not be available to provide an interpretation.

The basic elements

The basic elements of a license agreement are:

- The identity of the parties.
- The subject of the license (technology, patents, or know-how, for example).
- The licensor's obligations.
- The licensee's obligations.
- The common obligations of both parties.

There are also numerous terms and conditions that you will want to consider for your particular licensing agreement. Some of these include:

- Geographic range of the license.
- Royalties.
- Performance requirements by the licensee.
- Registering the license with the Personal Property Security Registry of the Province.
- Confidentiality.
- The rights of faculty inventors regarding publication where universities are the contracting parties.
- Protecting the research institution from liability.
- Insurance held by the licensee.
- Improvements to the subject of the license.
- Payment of taxes.
- Use of the research institution's name.

- Assignment of the rights.

The annotated sample licensing agreements can help you determine the type of arrangement best suited for you. However, it is always important to work with a good lawyer experienced in licensing arrangements.

A few notes on negotiating a license

Negotiating a license is an extremely complex process. You should prepare yourself by getting to know as much as possible about the organization, the value of the technology, and the individuals on the other side of the table.

Be realistic about timelines. Licensing negotiations do not follow a set timetable. For many promising inventions, it may be years before a window of opportunity opens up.

It is not uncommon for a technology to have been in development for 7-12 years before significant returns on an invention are realized.

Certain terms and conditions are commonly incorporated into the license agreement. These terms are outlined below, for discussion purposes only.

License agreements — rights granted to licensees

Rights granted to licensees typically include a non-exclusive or exclusive right to practice or manufacture products based on inventions claimed in pending patent applications or issued patents.

For exclusive licensees, sublicensing rights are negotiated. Sublicensing is generally not permitted with non-exclusive licensing.

Where patent protection is not available for an invention, licensees can still be granted non-exclusive or exclusive rights to practice and/or manufacture products based on trade secrets and proprietary information.

Consideration for the license

Financial compensation or "Consideration" due for the grant of a license typically includes the following:

- License initiation fees or up-front fees.
- Running royalties based on gross revenues received by the licensee through the exploitation of the invention.
- Minimum royalties, milestone payments, or other resource commitments by licensees to the commercialization of the invention.

Technology valuation

Specific payment amounts and royalty rates are determined by factors such as the nature of the invention, the potential market for the invention, the cost of manufacture for the invention, etc. (For further explanation about these factors, see Evaluating a Technology.)

Patent Expenses: Typically, the research institution expects licensees to pay for obtaining patent protection in the countries in which the licensees wish to practice the invention.

Confidentiality: All licensees are expected to preserve the confidentiality of the research institutions

proprietary information and trade secrets.

Protection of IP Rights: The licensee is expected to identify and prosecute patent infringements. In the case of a non-exclusive license, the research institution will typically agree to cooperate with the licensee in identifying and prosecuting infringements.

Indemnification: Licensees are expected to indemnify the research institution, which includes holding the institution away from any claims, actions, or other damages arising from the licensee's practices for the licensed technology.

Warranties: The research institution will typically disclaim any and all promises, representations, and warranties with respect to any licensed technology.

2.2 Acquiring Research Services

There are various types of research agreements that you will want to consider when entering into a research services arrangement.

They range from the granting of funds to an institution with relatively few deliverables, to the heavily defined commitments of an industry-sponsored research agreement, and the interactive nature of research collaboration.

The types of legal agreement that govern these arrangements vary according to the level of complexity and the breadth of obligations that each party undertakes.

How to make the research agreement work

Regardless of the type of research mechanism you agree upon, the agreement will not work well unless there is involvement and communication between the researcher, the institution, and your organization in the development of the research project, budget, work plan, and deliverables.

Any sustaining relationship is built on trust between the parties. To ensure the establishment and maintenance of trust, commitments must be realistic, reasonable, and achievable.

In building these relationships, it is essential that both sides recognize the fundamental concerns of the other:

- Always deliver on the commitments outlined in the contracts.
- Make sure the project is completed on time and on budget.
- Maintain open communication between the parties.

Most of the agreements that have "gone sour" result from lack of communication between the parties. Therefore, it is essential that the researchers and the company representatives remain in continual contact.

Working with a university or public research centre

Most university research agreements have been fashioned after the "Simplified and Standardized Model Agreements for University-Industry Cooperative Research." This model was published by the Industrial Research Institute, National Academy Press, Washington, D.C.

Within each research institution, there are various review processes, depending on the nature of the work undertaken. These review committees include:

- Ethical Review: Approval for the use of humans in research.
- Animal Care Review: Approval for the use of animals in research.
- Safety Committees, including Biosafety, Radiation Safety, Hazardous Material, etc.
- Conflict of Interest.

The research agreements with will vary depending on the institution's own internal policy regarding external research activities and intellectual property ownership.

Special note on public sector labs: There may be other considerations such as a "Canada First" requirement. The lab's business development office will be able to tell you more.

Industrial Research Agreements

Industrial research agreements can be quite specific — the sponsor has a particular problem for which they require a solution. The industrial sponsor will launch a search to find the appropriate institution that has the necessary expertise and infrastructure to solve the problem.

Once the field has been narrowed, the contract research organization can be approached through either the researcher or the technology transfer office.

Once appropriate capabilities have been identified, a standard industrial research agreement will be negotiated which considers the following terms:

- The research protocol as defined by the sponsor (but developed with input by the researcher).
- The confidentiality clauses, which are designed to protect the sponsors' proprietary information and intellectual property.
- The assignment of the intellectual property ownership resulting from the research.
- The sponsors' access to the intellectual property.
- A detailed budget, including overhead charges. Overhead charges are levied as a percentage of direct costs. In Canada, the average overhead rate is 38% on direct costs. In the U.S., the overhead rate ranges from 38% to 100%, or higher, of direct costs.
- The possibility of temporary restrictions on publications.
- The specific timetable for deliverables.
- Termination clauses which protect the interest of all parties.

Consulting agreements

Consulting agreements are characterized by the following:

- They are short-term in nature, though they can be reoccurring or on a retainer system.
- They do not require "creative reduction to practice." That is to say, the consultant is not actively involved in proving that their suggestions (or advice) are workable or solve a particular situation.
- Neither the researcher nor the institution becomes involved in the development of the ultimate product or process.

An example of a Consulting Agreement can be found on the Association of University Technology Managers website under the Sponsored Research Agreement section.

2.3 Collaborative Research Agreements

A collaborative research agreement has different deliverables and obligations from those found in Industrial Research Contracts (although the format of the agreement is very similar).

A collaborative research agreement brings together ideas, technologies, and creative power.

Accordingly, the respective responsibilities, and in-puts and out-puts of each party, need to be defined in the work plan.

In addition, the ownership of any resultant intellectual property (IP), the rights to use such IP, and the ownership of any enhancements or derivations all needs to be negotiated and described in the agreement.

It is essential that a collaborative research and development project address the following:

- The aim of the research project, and each party's contribution to it, must be defined jointly by the sponsor, and the university and its researcher.
- The ownership of inventions, software, copyright, biological materials, know-how and trade secrets — and whether they rest with the university or are jointly owned with the sponsor.
- The sponsor's right to utilize the research results in its commercial enterprise. Traditionally, in North America, these rights may take the form of a non-exclusive royalty-free license, or an exclusive royalty-bearing license. These rights need to be negotiated and defined. This may extend to the actual terms of the licensing agreement being negotiated and set forth in the research agreement.
- Publications, which may be temporarily restricted, and the sponsor's confidential information, which may be protected to the best of the university's or institution's ability. Most publication restrictions are limited to six months.
- Overhead costs above-and-beyond the actual project costs. These need to be identified at an early stage and collected. In Canada, the average overhead rate is 38% of direct costs, which is added to contracts. In the U.S., the overhead rate ranges from 38% to 100%, or higher, of direct costs.
- Confidentiality clauses, which endeavour to protect the sponsor's intellectual property and proprietary information to the best abilities of the institution.
- Termination clauses, which protect the interest of all parties.

2.4 Grant in Aid of Research

A Grant in Aid of Research is a fairly simple agreement. It outlines the fact that the sponsoring company is "donating" money to a research institution for a specific project with no deliverables.

This means that any resulting intellectual property will be managed by the institutions according to their policy, and that the sponsoring company will have no rights to that intellectual property.

The agreement will address the following points:

- The amount of funding by the sponsoring company.
- The publication rights of the researcher.
- The lack of overhead costs charged on the project. (Those costs are covered by the general administration of the university.)
- That there will not be grant of rights to any results arising out of the research project.
- That the acquisition of rights to intellectual property will be at "fair market value."

2.5 Confidentiality Agreements and Conflicts of Interest

Research contracts of all types invariably include clauses that deal with confidentiality. This may also be referred to as a Non-Disclosure Agreement.

The organization from which you are acquiring the technology will want to enter in to a confidentiality agreement before disclosing information about their work to third parties.

How do universities address confidentiality?

The common practice in North American universities is NOT to perform secret research. However, the universities will accept confidential material in written form which is marked confidential, and will use their best efforts to maintain it as so.

Universities will usually allow limited time restrictions on publications, to allow for review of the material by the sponsor, and the filing of patents or other types of intellectual property protection.

As the research project may be related to the academic research program of the researcher, your firm must be sensitive to their need for published papers and theses.

The involvement or association of graduate students and post doctoral fellows is another consideration to be discussed during the negotiation process.

At most institutions, the maximum time that a thesis may be delayed is six months. Publication delays which have been negotiated into research agreement can vary from 90 days to one year.

In Canada and the U.S., there are government research facilities and private research institutions that have considerably more flexibility in restricting publications and maintaining confidentiality.

With private research institutions, publications will be delayed until patent protection has been filed. Most researchers, however, regardless of location or employer, will be strongly motivated to publish as quickly as possible.

One point of discussion is that the university will undertake only to "use their best efforts" to maintain confidential proprietary. Students, graduate students, post-doctoral fellows, and even the faculty themselves, can and do move around. Combined with the fact that most universities and research institutions are-not-for profit,educational institution, have to limit their liability and obligations when it comes confidentiality. Your firm is advised to provide confidential proprietary information on a "need-to-know" basis only.

Conflict of interest

Conflict of interest arises in situations where either the researcher or the institution have competing obligations for their time, resources, or intellectual property. A moral conflict of interest may arise where a researcher's personal interests lead them to be biased or not able to complete their obligations to the institution.

Conflicts of interest that may arise in the context of a research agreement include:

- Consulting agreements with an industry sponsor.

- Clinical trial performance which includes shares in the company or personal income.
- Ownership or participation in a start-up company.
- Performing similar research projects on different industrial sources of funds.

When working with industrial contracts, these temptations increase, and vigilant review on behalf of the research institution is required.

Each institution has their own policy and procedures governing how conflict of interest is reviewed, evaluated, and handled. At most Canadian institutions, the researcher is required to declare potential conflicts of interest in writing, once a year, to their department head. More frequent reports may be filed if necessary, and at the discretion of the researcher.

U.S. institutions have had more experience in handling difficult conflict of interest situations. The stated policy in most U.S. institutions also requires full disclosure, which is reviewed by a specific conflict of interest panel.

The rationale for using a panel instead of the department head is to remove the natural bias that members of the same department share, and to provide a higher level of control on the situation.

Each situation is unique, and the remedies that are available to the institution vary accordingly.

If the researcher is not allocating sufficient resources to his obligations at the institution, the first warning is often a verbal reprimand. The course of action may progress to written reprimand, to written requests that the outside activity or interests cease. In severe cases, the individual may be asked to leave the institution.

2.6 Material Transfer Agreements

If you are involved in the development and transfer of biological materials, it is important to control their use.

A material transfer agreement can be used to control the development and modifications or derivative products from the original materials.

Standard material transfer agreements are now being used by most institutions in North America.

Consult your institution's Intellectual Property Management Office before you transfer any biological material to any academic or industrial collaborator/researcher.

In an effort to standardize the wide variety of agreements that cover material transfers, the Association of University Technology Managers (AUTM), in its Technology Transfer Practice Manual, provides sample documents.

The two included in the selected resources above, are based on AUTM's Uniform Biological Material Transfer Agreement.

The Simple Letter Agreement may be used when obtaining, providing, or exchanging material with another non-profit institution.

The more detailed Industry/Non-Profit Biological Material Transfer Agreement may be used when obtaining, providing, or exchanging material with a for-profit entity where commercial interests need to be protected.

2.7 Option Agreements

Rights granted to Optionees typically include an exclusive right to evaluate the information available on an invention during a specified period of time.

This means that the research institution will not license the invention to a third party during the option period. In consideration for such an option, an option fee is paid.

In many cases, inventions require further research and development before they can be commercialized. Entering into a combined research and option agreement is a useful means of protecting a potential licensee's interest in the invention, while simultaneously preparing it for the market.

This option period gives the optionee time to fully evaluate the invention before making a substantial commitment to a license. Options to resulting intellectual property are often included as terms of a supported research agreement.

3.0 Evaluating a Technology

Assessing the technical and market viability of technology opportunities is perhaps more of an art than a science. This is especially so in fast-moving, high-technology fields involving first-of-a-kind products.

Stories abound of technologies and newly invented products that were assessed as having little commercial potential at the time, but that subsequently became of major importance (eg: the Xerox copier, the surgical stapler).

The technical and market assessment of a product is not therefore a "one time event," but rather a series of evaluations at each stage of the financing process. Such a step-by-step process (the "stage-gate" method) will increase the probability of making the right decisions.

It is also important to understand that if a technology does not meet your criteria, this does not mean that the technology should be entirely abandoned.

Many larger organizations allow staff to continue working part-time on technologies and new products that have failed the formal assessment process, but in which staff members still have faith (the term "skunkworks" is often used).

This arrangement protects firms from making a potentially incorrect and costly decision to abandon a technology or product that may subsequently turn out to be very important.

3.1 Using Invention Disclosure System to Screen for Promising Technologies

Larger organizations wishing to identify promising technologies must first put together an "inventory" of technologies or research projects in order to "screen in" those with commercial potential.

A key mechanism for building this list is an invention disclosure system.

An internal invention disclosure system requires your scientific/technical staff to notify you when they believe that they invented something of commercial potential.

The purpose of a disclosure is to permit you or your research staff to begin the evaluation process and determine whether commercial development is feasible. A disclosure should be complete enough to allow someone having knowledge in the field to understand the technical merits of the work and possible practical applications. Information that helps evaluators understand the invention will increase the chances for successful market development and intellectual property protection.

Invention disclosure documents should also:

- Identify financial support used during the development of the invention. This is very important in determining ownership and licensing rights in the invention, and whether there might be contractual obligations to the external research sponsor.

- Identify those individuals who actually made original, inventive contributions to the invention. Each co-inventor/creator should be identified by his/her full name and address.

The inventor(s)/creator(s) should also authenticate the disclosure by dating and signing it. In addition to alerting your organization to new exploitable opportunities, invention disclosures also have an important function of protecting your intellectual property. Patent laws in Canada and most other countries are strict.

Any protection is immediately lost upon public disclosure unless a patent application is filed prior to such disclosure. Therefore, to ensure the possibility of worldwide patent protection, it is important that research results and new technologies be submitted for timely review.

Other approaches you can take to identify potential technology opportunities:

- Use a knowledgeable person to visit with the researchers and learn about their past and present work. This person can be an employee or a person under contract to "ferret" out previously unrecognized commercial or transfer opportunities.
- Establish a program of visits and interchanges with industry to develop communication channels. This may result in identifying commercially viable applications for technologies.
- Establish a communications and publicity program which highlights research projects being conducted at the centre.

Tips on making your invention disclosure system work

- Establish high-level support within your organization for technology transfer activities.
- Establish inventor-friendly invention disclosure and patent systems.
- Recognize that technology transfer is a legitimate, valued activity.
- Establish a suitable reward and incentive system to motivate technical staff.

Pitfalls to avoid

- An invention disclosure system that involves a lot of red tape and extra administrative work for the researchers.
- A lack of appropriate reward and recognition system which may discourage researchers from disclosing inventions or cooperating with visiting "technology ferrets."
- A reward and recognition system that over-emphasizes publication to the detriment of technology transfer activities

3.2 Evaluating Technical Feasibility

A preliminary technical feasibility evaluation is designed to help you assess whether the technology is patentable and worth pursuing as a transfer opportunity.

During this stage, details on everything the product will do and how it works should be documented. Performance specifications should be mapped out and discussed with technology advisors.

One of the first things you should do is undertake a goo patent search to see whether all or part of your technology is already owned by someone else. If your invention is patentable, then a team should be put together that gives a wide spectrum of views — from engineering to marketing. The evaluation should indicate whether the technology has been shown to work or whether more research or development work is required. In the latter case, there may be an opportunity to involve a prospective adopter in some of the development work.

Think outside the box

One of the most important elements at this stage is to consider alternative uses of a technology. You should spend a good amount of time researching and thinking about other applications outside the one you envisage. Frequently, a product developed for one use will be successfully commercialized in another not initially intended.

A preliminary technology evaluation guide can assist you in the evaluation. But remember that each technology is unique, and should be evaluated on its own.

If the results of the preliminary evaluation indicate that the technology is technically feasible, a preliminary market feasibility assessment should be conducted.

The results of your assessment should be summarized in a business opportunity document that clearly and concisely defines the idea and what you believe to be its potential applications.

Best practices

- Include end-users or the end-user perspective in the development of performance specifications. The earlier in the development process these perspectives are included the more likely design defects will be identified.

- For a technology licensed from an outside source: Chances of success are increased if the outside source is willing to participate in further development of the technology to the prototype stage; or, in the case of a process, to demonstrate its merits in a field trial.

- Technology to be transferred can be adopted/utilized incrementally, and will not cause great disruption to the adopting firm.

Pitfalls to avoid

- A lack of understanding of how a customer would actually use the product (the better mousetrap myth).
- Over-development of the technology. Researchers often add "bells and whistles" that would add to

the production costs but would be used by few consumers.

- Attempting to transfer the technology before knowing whether it can operate under the conditions in which it will actually be used.

3.3 Preliminary Market Assesment

If your technology concept is evaluated and judged to be technically feasible, a preliminary market assessment is the next important step.

The purpose of the preliminary market assessment is to get an idea of the potential market, its size, competitors, partners, and potential applications in other markets.

This should provide you with enough information to determine if the new technology concept is worth pursuing. It should also give you enough information to seek seed capital financing.

A preliminary market assessment also lets you avoid the cost of an in-depth market research study, and the possible loss of secrecy that such a study might entail.

While there is no one technique for conducting a preliminary market assessment there are a number of checklists available through the Toolbox.

These checklists will detail the questions you should be asking and the kinds of information you should be collecting as you go through the evaluation process.

3.4 Valuation of Intellectual Property

Intellectual property valuation
(courtesy of the University of Manitoba)

There are many approaches to the valuation of intellectual property (IP). This is particularly so given that the licensee and the owner(s) of the IP may have different perceptions of value.

The acceptable valuation is essentially whatever the two parties can agree upon. The past costs of development of the IP are generally irrelevant.

The objective in structuring a license agreement is to earn fair value in a package that includes initial payments, license maintenance fees, and royalties in exchange for the right to practice the IP.

Some common approaches to valuation include:

- The one-quarter rule: An often-stated division of the pre-tax profits that flow from an invention is 25% for the inventor, 25% for the developer, 25% for the manufacturer, and 25% for the distributor.

  For embryonic technology, the owner(s) of the IP usually can claim only 25-35% of the profits.

  It should be noted that pre-tax profit margins vary widely by industry. Further, if the invention is only a small part — and not the essence — of the product, the royalty rate should be pro-rated according to the value of the invention relative to the product.

- Licensee's alternatives: The value of the IP may be determined by the cost of the licensee's alternatives to accomplishing the same end.

  These can include (a) the cost of invention of solutions that avoid the IP in question; (b) the costs of developing alternative solutions to a stage similar to that of the IP in question; and (c) the costs incurred by delaying product development.

- Licensee's customer's alternatives: The value of the IP may be determined by the cost of alternative solution to the problems faced by the end-user of the technology.

- Industry Standards: Valuation, especially royalty rates, may be determined on the basis of past practices in the industry.

  This approach is simple and useful for defining a range of royalty rates. However, the defined range may be quite wide.

  It is also difficult to compare rates from one agreement to another because the non-royalty terms of other agreements can be expected to vary widely. Accurate information on industry standards may also be difficult, because terms of license agreements are generally not made public.

- Competitive bidding valuation: When there are a number of potential licensees, the most attractive offer can be chosen.

Risk-adjusted valuation

Royalty rates may be adjusted from a standard rate by a factor that takes into account the technical and business risks associated with new product development.

Generally, early-stage technologies present more risk; therefore, the owners of the IP can expect to receive a lower-than-standard royalty rate.

The owners of the IP are in a stronger position to obtain a fair deal if they have knowledge of the factors which affect the value of a license.

Such factors include:

- The scope of IP protection.
- The nature of the technology, and the nature and size of the market for dependent products.
- The stage of development (e.g. how close it is to being market ready).
- The scientific significance of the technology (breakthrough or incremental improvement).
- The range of possible applications of the technology.
- The likelihood of the patent being granted and being commercially valuable.
- The investment required to develop a marketable product.
- The nature of competing methods or products.

3.5 Benchmarking Your Technology

Benchmarking is a method of comparison against some standard of excellence.

It was pioneered by Xerox Corporation in the 1970s, as part of its response to international competition in the photocopier market. Benchmarking originated from reverse engineering of competitors' products. Its scope was then enlarged to include business services and processes.

Xerox now benchmarks close to 240 performance elements – much more than when they started benchmarking several years ago.

Benchmarking of business processes is usually done with top-performing companies in other industry sectors. This is feasible because many business processes are essentially the same from sector to sector.

A benchmarking team usually consists of six people, but may include more. A leader is assigned and takes "ownership" of the project. Investigations take from one to 12 months and can involve one company or a consortia of many companies.

Comparing performance levels is only the preliminary phase of benchmarking. The bulk of the effort involves an analysis of how and why these performance levels are achieved.

The ten steps to benchmarking:

1. Identify what is to be benchmarked – a service, process, or practice.

2. Identify the organization(s) you want to benchmark against. These may include other operating units within your company, competitors, or unrelated companies. However, they should be a leader or "best in class" in the area being benchmarked.

3. Determine the data collection method and then collect the data. Measurements must be chosen to provide a meaningful comparison. Collection usually involves in-person meetings and site visits of areas being benchmarked.

4. Determine current performance levels. This includes identifying gaps between your organization and your benchmarking partners.

5. Determine future performance levels. Forecast the expected improvements of benchmarking partners so that goals set for the improvement program will not become quickly outdated.

6. Communicate the benchmark findings and gain acceptance from senior management and employees who will be asked to make improvements. Present the methodology, findings, and strategies for improvements.

7. Establish objectives. After concurrence on findings and strategy, the team presents final recommendations on goals and how the organization must change to attain them.

8. Develop action plans for each objective. They should be designed to gain the required support within the organization.

9. Implement specific actions and monitor the process. This includes collecting data on new levels of

performance; using problem-solving teams to investigate problems; and adjusting the improvement process if goals are not being met.

10. Recalibrate benchmarks. Benchmarks should be re-evaluated and updated, based on the most recent performance data.

This ten-step process closely parallels the PDCA Cycle and other methods discussed in Process Improvement Methods. However, companies which undertake benchmarking find that it is a very complex process.

We recommend that before undertaking benchmarking, those involved should read the literature, such as Robert Camp's book, Benchmarking: The Search for Industry Best Practices That Lead to Superior Performance (Quality Press, 1989). Also, talk with companies which have benchmarking experience.

4.0 Developing a New Technology

Once you have assessed your technology for both technical and market potential, you will need to develop performance specifications.

These functional specifications will be the basis on which you begin the engineering, prototyping, and production of your technology.

It may be a good idea to look for technical expertise to assist you in this complex process. Inventors will often jump into product development without having detailed the technical requirements adequately.

Technical assistance can be obtained from both public and private sector specialists, and organizations such as technology centres, industrial designers or consulting engineers.

4.1 Prototyping

Once you have documented or described your product, developed the performance specifications, and reviewed them with your team or advisors, you can begin the process of engineering a prototype.

The prototype serves a number of purposes, including determining that the product will work. The prototype also serves to highlight design flaws and defects that need to be resolved as well as providing a model which can be used to sell the technology.

Prototype development often goes through a number of stages that include:

- The drawings or plans – including a description of the final product and the initial functional specifications.
- The non-functional model – which shows colour, size, styling and design in a three dimensional model.
- The working model and proof of concept prototype – which is fully functional and strong enough for demonstrations.
- The pre-production model – which incorporates further improvements and addresses defects that may have been uncovered.
- The production model – which is exactly like the final product, with the same tooling and materials.

If you do not have the skills or resources to develop the prototype, there are experts to assist you. These include professional designers, consulting engineers, manufacturing firms with prototyping facilities as well as many provincial and federal laboratories that specialize in your particular sector of interest.

Prototyping tip

At each stage of the prototype development, try to conduct a market review and, if possible, an end-user review to determine changes that should be made.

Investigate the market

Before you begin developing the prototype, ensure you have adequately investigated the market and technical potential of your product. Significant resources have been wasted developing a prototype for which there was no market.

4.2 Industrial Design

Industrial designers are an important resource, and they often initiate technology transfers into firms.

With their knowledge and technical competence, industrial designers can specify materials, components, and processes for new or improved products.

Industrial design is too frequently thought of only in terms of improvements to the aesthetics of products. But industrial designers can also do in-depth work to improve the technical aspects of the product and its manufacturing process. They should be included in the prototype development of your product.

The results of good industrial design work may include:

- Fewer parts.
- Simplified assembly.
- Lower packaging and shipping costs.
- Higher quality.
- Lower production costs because of superior production technologies.
- Lower product warranty and servicing costs resulting from improved quality facilitation of product servicing in the field.
- Increased attractiveness to the customer in terms of ergonomics, for example

4.3 Standards and Regulations

Where to start

The regulatory and standards requirements vary significantly from product to product.

If you are looking to commercialize a new software product, the scenario is quite different from the complex standards and regulations affecting the commercialization of a medical device or new drug.

It is important to begin by determining the regulatory frameworks and jurisdictions that apply to your product at the outset of development.

In some cases, there may be consensus standards that have to be followed, while in other cases extensive testing and certification processes will be required.

You should contact relevant organizations such as standards associations or government regulatory departments.

These organizations can answer questions about the processes and regulatory requirements. They also have guidebooks and documents that can help you in navigating the maze.

4.4 Testing

In sectors such as health care and the environment, you may need to demonstrate compliance with the necessary regulations and standards.

In these cases, your product or technology will have to undergo testing and certification by a recognized testing organization. Or, your own manufacturing and development processes and facilities will have to undergo a certification process.

How will product testing be carried out?

If you are already involved in manufacturing or in prototype production, product testing will normally be carried out on a production sample. The testing will often include destructive testing.

Failure to meet certain requirements will result in the need to re-test the product.

How to avoid the pitfall of re-testing?

First, someone in your organization should become knowledgeable about all the test requirements for your product – at the earliest design stage. Second, make early contact with the testing and certification laboratory which will carry out the testing.

Most laboratories will provide consultation with test engineers to help ensure that the product design and construction will meet the stated requirements.

Testing and certification laboratories

A testing and certification laboratory – or test house – is an organization that has been certified by a national authority to carry out the function of testing and certifying products for the marketplace.

In Canada, this process is administered by the Standards Council of Canada.

How much does it cost to get certification?

Regulatory agencies and testing laboratories charge for their services. These charges are either on a flat-fee basis or by the hour. Consultation with test engineers on product design may be charged at a different rate. The Canadian Standards Association will charge by the hour.

Roughly speaking, the total cost for a Canadian manufacturer to obtain pre-testing, consultation, testing, and certification for a major technology will be $5,000-$10,000 if the product passes, and considerably more if there is a requirement for re-test. Cost for preparation for the testing can be at least as great.

Frequently, product certification is valid only for a fixed period of time, or involves a maintenance charge. This is because certification often includes the manufacturing process and ensuring that this process is identical to the initial testing process.

4.5 ISO 9000

The ISO 9000 series of standards are standards for quality assurance.

The standards provide guidelines which, if implemented, indicate that your products or services will be of consistently high quality.

For this reason the ISO designation is desired by manufacturers since it demonstrates to customers and potential customers the quality of your product.

The accreditation of products under these quality standards is being demanded more and more frequently. ISO standards are also being demanded world-wide by purchasers of manufactured technology.

5.0 Managing the Technology Process

Commercializing a technology can be a risk-filled management challenge -- particularly in today's highly competitive global economy.

Promising commercialization efforts can fail when market entry is poorly timed, financing is inadequate, or when unforseen technological advances dramatically alter the market.

It is therefore extremely important to review all the commercialization options before moving ahead.

At one end of the spectrum, you may want to start your own company. This is the most resource intensive, time-consuming option available. Starting your own company should not be done unless the technical and market conditions are favourable. This being said, it can also be extremely lucrative.

At the other end of the spectrum, licensing or selling your technology outright while providing you with less financial compensation, will leave you free to pursue other interests.

Undertaking a clear, objective assessment of your technology's potential, the market potential, and your own capabilities and commitment will give you a good basis to determine which option is best.

5.1 Licensing a Technology to Another Firm

The licensing agreement is a common approach to commercializing technologies from federal labs and universities as well as smaller firms. It is worth noting that large firms are also using licensing to generate revenue from technologies outside their core lines of business. This mechanism will allow you to retain some rights over the technology and continue to develop the technology concepts without having to make significant investments in the commercialization efforts. However, you should expect to take a much smaller share of the profits.

Typically, licensing agreements generate some up front payments followed by royalties accrued from sales. You may also want to look at taking an equity position. This will defer revenues but it may be useful if you are dealing with a smaller company that cannot afford the up-front licensing fee. Equity positions are more and more being looked to by university research organizations. If you work within an institutional context some restrictions may apply and you should check with your business office to find out what the policies are regarding equity stakes.

Factors in choosing to license a technology:

- You would prefer immediate cash flow.
- You will want to further develop technologies based on your intellectual property.
- Your technology in not "platform" but is a peripheral innovation.
- Your technology is outside your core line of business or interest area.
- You do not want to commit significant amounts of time and effort to commercialization.

5.2 Start-up

Starting your own business requires considerable time, energy, and money. Your new company will have to build credibility with the financial community and the marketplace since it is unproven . If you are a researcher, prepare to be thrust, quite suddenly from a technical job into the role of global entrepreneur. Do not expect to continue spending significant amounts of time on research. If you are not experienced with starting and running a technology company, your best bet may be to recruit experienced professionals. You will need to find the right people for your management team. In the early stages it may be difficult to assemble a management team. If you can get one or two entrepreneurs with experience in commercialization this will often be enough to reassure venture capitalists. Venture capitalists or angel investors, especially those focused on seed capital, may be able to help you with networking, and finding talent to fill out your team.

You might also consider locating within a business incubator, because these organizations often provide education programs, professional advice, and low rents to help support fledgling companies in the start-up phase.

Factors in choosing to start up your own company:

- You have a platform technology, a basis from which other technologies can be developed.
- You have a large potential market for your technology.
- You have a strong intellectual property position - clear title to the technology patents.
- You have a defined development path for your technology.
- You have a unique product - there are no others like it on the market.

5.3 Developing Strategic Alliances

One way to commercialize a technology is to approach a larger firm to partner on the research, development, and commercialization of the technology.

Larger firms may be motivated to work with you if your technology fills a gap in their product line. This has the advantage of identifying a clear receptor market for the technology before expenditures on its development are undertaken.

Striking an arrangement with a large firm will also allow you to tap into larger pools of capital, established distribution channels, and management and marketing expertise.

A second reason why a large company may be interested in striking an alliance is if your technology can provide a lower-cost solution to a production problem the company faces.

A good example would be a new environmental protection process that will reduce a company's waste disposal costs or a management resource software application that will improve operational efficiency.

More information on strategic partnerships can be found in the business literature as well as on Strategis.

Factors in undertaking a strategic partnership:

- You wish to accelerate the time to market.
- You have identified a solution or product gap in the market.
- You would like early market validation of your technology.
- You are willing to commit to an ongoing business relationship.

5.4 Spinning off a Company from Your Existing Organization

Spinning off a company is essentially the same as starting up a new technology-based firm.

It differs in that the new company will belong, in whole or in part, to the organization that developed the technology.

This practice runs counter to the conventional wisdom of licensing new technologies only to established companies with adequate technical, managerial, and financial resources.

Spin-offs have emerged for the following reasons:

- Larger private companies find that their internal culture and organization are significant barriers to successfully exploiting new technologies.
- Private companies, and public organizations such as universities, often discover that suitable, existing firms cannot be found to exploit the new technology.
- Public organizations wish to exploit the technology locally, but no suitable local firm exists to commercialize the technology.
- Private firms and public organizations decide that creating and licensing a spin-off firm to exploit the new technology has the potential to generate significantly greater returns in the longer term.

There are, however, potential disadvantages to creating a spin-off company, as opposed to licensing to a competent existing firm, such as:

- The need for capital investment.
- Significant outlays of management time for monitoring and assisting the new firm.
- Possible conflicts of interest.

5.5 Selling Technology Outright

One of the least resource-intensive approaches to commercializing your technology is to sell it outright.

Typically, this would entail a lump-sum payment for the technology and all rights associated with it. Royalty payments based on revenues generated by that technology may also be factored in.

This process has the advantage of providing you with an immediate cash flow. In addition, the risks associated with investments of time and money are reduced. Selling outright will also allow you to pursue other research or technology opportunities.

On the down side, you will no longer have a say in the technology's further development, nor will you be able to reap the often significant benefits of a successful technology.

Factors involved in choosing to sell technology outright:

- You have little interest in devoting your time to managing or overseeing commercialization.
- You would prefer immediate cash flow.
- You do not need to hold the intellectual property to further develop related technologies.
- Your technology is not "platform" but is a peripheral innovation.

5.6 Business Planning

Whatever commercialization path you take, you will you will need to do some business planning.

If you opt for an outright sale of your technology, you still need to determine your market; get an understanding of the value of your technology to negotiate a price; and develop some documentation to interest prospective buyers.

Starting up a new business will, of course, require a significant and detailed business plan. But it may not be necessary to develop this as your first step.

A good starting point would be a business opportunity document, in which you can touch on all the major elements of your technology. This can be used to approach venture capitalists and other groups: if they are interested in your technology, they can provide experience and expertise in writing a more detailed business plan.

Business opportunity document

A business opportunity document is a short (2-3 pages), non-confidential version of a new product, or process business plan. It is designed to provide a potential adopter with the minimal amount of information needed to encourage further, in-depth enquiries (Doyle, 1992).

Before preparing a business opportunity document you will have to conduct more detailed technology assessment, a market research assessment, and prepare preliminary financial projections.

A business opportunity document should contain the following information:

- **The business opportunity**

  A simple, short statement of why the potential adopter should invest in the further development of the technology to bring it to market.

- **The technology**

  A brief description of the technology. It allows the potential adopter to determine whether it is compatible with existing internal expertise or capabilities.

  The stage of development and the patent status of the technology should also be indicated along with any advantages it has over existing technologies.

- **The product/services**

  A short description that identifies the products or services resulting from the technology, and the any or additional benefits they have over existing products or services that presently service the market.

- **The market**

  A general description of the initial and future markets for the technology and some indication of the size of the market, e.g., small niche, a growing market, large public market, etc.

- **The investment and payback**

  An indication of how capital intensive the exploitation process is likely to be, and the timing and magnitude of the payback.

- **Technology transfer mechanism**

  A statement describing the originators preferred technology transfer mechanism, e.g., license, collaboration, or outright sale.

- **Contact information**

  A short statement listing the name and phone number of the key contact person in the technology transfer office, along with the name of the inventor(s).

The business plan

A business plan for a technology opportunity (a new product or new process) should be seen as the most comprehensive assessment of the commercial potential of that technology. It should be an objective assessment of the wide range of factors relevant to its survival in the marketplace.

However, the promoters of a specific technology opportunity often make the business plan into a "selling" document in order to obtain financing. This reduces its objectivity and its accuracy, making it harder to evaluate the opportunity and its chances for survival.

Further, many business plans are simply not well done. Sophisticated software packages are now available to assist with the preparation of a good business plan. Other software packages can help you develop the marketing component of the plan (e.g. CRUSH).

These software packages join an excellent reference literature advising on business plan preparation. It is a good idea to use these references ans resources. They can't guarantee success, but they can point you in that direction.

5.7 Setting up a Commercialization Team

For many larger firms, public sector laboratories and universities, whose primary business is not new product development, commercializing technology is a relatively new undertaking.

Standard practice for these organizations is to set up a multi-disciplinary team or specialized business development office, to manage commercialization efforts.

These teams typically are made up of individuals with experience with in the technical and the business side of commercialization.

Several studies on best practices in setting up a commercialization team have been developed by the Federal Partners in Technology Transfer, Stargate consulting and others.

Best practices to keep in mind include:

- Recognize that a complete team will be necessary, covering off intellectual property, marketing, contracting and other important functions will be necessary for each project. Allocate the necessary time and financial support for the project manager to identify and recruit this skills base.
- Support from senior managers is essential to the smooth operation of the commercialization team. Commercialization can be a resource-intensive effort, and payoff will be take a significant amount of time. Ensure that expectations about results are realistic and well-documented.
- Commercialization teams should attempt to bring together both the inventor and a potential client or technology adopter as early as possible in the development cycle. If a client or adopter cannot be recruited, it may indicate a lack of market interest or the need to re-profile the target market.
- Identify sources of early stage seed/risk money to support technical and market feasibility studies, and the development of prototypes.
- Put in place an appropriate disclosure process to facilitate the identification and screening of new technologies and to protect the organization and the inventor's intellectual property rights.
- Consider the implementation of fast cycle and stage-gate project technology management techniques currently employed in the private sector. This will help the screening and evaluation of technologies within your organization.
- Minimize and reduce bureaucratic and regulatory barriers, and disincentives to commercializing technology. This applies to your potential clients and to your own researchers and inventors.
- Foster regular interaction between the commercialization team, the potential client community, financial organizations, and the researchers or inventors in your oganization.

6.0 How to Find and Obtain Financing

Perhaps the most important reason for failure of a technology commercialization effort is the inability of an inventor or small company to attract and maintain financing.

Even if your idea is one with significant potential, financing will be difficult to obtain unless you have a credible management team, a good business plan, and have identified your market.

Attracting financing is an ongoing effort. Success in the initial rounds is no guarantee that later rounds will be an easy matter.

One of the most critical mistakes made by a new business is underestimating the capital requirements — in terms of the ongoing costs and the length of time it will take for revenues to be generated. You may find that you run out of funding at a critical stage.

Again, an excellent business plan and a competent management team will help avoid these pitfalls.

An inventory of public and private financing sources can be accessed through the toolbox. It is critical to keep in mind that your commercialization effort may involve funding from a variety of sources at different stages of the commercialization process. Remember to keep a clear view of all your financing options, both public and private.

6.1 Public Assistance

A number of federal and provincial government programs provide financial assistance for commercializing technologies, both for start-up firms and — existing companies. Programs like Technology Partnerships Canada provide funding or grants for technology development. Other programs provide marketing and export support.

Several government programs also focus on providing advisory services. One of the most important programs in Canada is the Industrial Research Assistance program (IRAP), which provides services and access to funding programs at more than 200 locations across Canada.

Qualifying for government programs

Government programs are often focused on specific target groups at specific stages of development. It is worthwhile looking closely at eligibility requirements, to ensure that your proposal meets them.

Typical requirements include:

- Affiliation with a Canadian company or a base of operations in Canada.
- Targeted sectors, such as biotechnology or aerospace.
- Support for specific commercialization stages: pre-competitive research, prototype development, for example.
- A business plan document, on which to base funding decisions.

6.2 Tax Credits

Another source of development funds are Canada's R&D tax credits. These credits are some of the most generous in the world, with part of the credit being refundable in the early stages of commercialization.

6.3 Venture Capital

A range of private sector financing sources exist for funding technology commercialization projects in start-up companies.

These include affluent individuals or "business angels," venture capital firms created through tax incentives, and enterprise-based venture funds set up by large corporations in their areas of business.

These various venture capital sources differ in size, geographic focus, area of technology, and in the minimum and maximum amounts of capital they wish to invest in individual projects.

Sources of information on venture capital firms are relatively easy to obtain. The Canadian Venture Capital Association contains a list of its members and links to member websites.

Finding "business angels" is more difficult and may require some legwork. A number of forums have emerged through which you can access angel investors. Some good places to start would be the local chamber of commerce/board of trade, economic development agency, local technology industry association, or university technology management office.

Finding the right venture capitalist

Before attempting to secure venture capital funding, you should ensure that this source of funding is right for your situation.

You need to know up front that the venture capitalist will likely **not** be at arms-length from the commercialization process. Expect some degree of participation in the business decisions affecting their investments.

You should meet with a select number of venture capitalists (VC's) to see if; you are comfortable with them on a personal level. You should also ensure that you are satisfied with the VC's time frame for return on investment (4-8 years, typically), their expectations on rate of return. Your meetings should also help you determine if the VC has adequate financial resources for your project.

The venture capitalists expectations

Venture capitalists will often want to take an equity position in your start-up, and will expect significant rates of return.

Out of every 10 investments a venture capitalist makes, there will be two companies that generate significant returns (several times return on capital), six where capital is returned, and two where the investment is lost.

Venture capitalists will also want an exit mechanism. The three most common are: buy-back of shares by company; sale of shares to a third party; and public offering of ownership. Meeting with a venture capitalist should initially be done through a third party, either a lawyer or accountant, who is, if at all possible, familiar with both parties.

Many venture capital websites will provide some information on their criteria.

Types of venture capital

- Seed Financing — It is normally provided to prove a concept and develop a prototype.
- Start -Up — It is normally provided for product development and initial marketing.
- First Stage — It is normally provided to initiate full commercial production and sales.
- Second Stage — It is normally provided for expansion to move the firm to profitability.
- Third Stage — Also called Mezzanine Financing, provides capital for major growth expansion.

6.4 Angel Investors

What are Angel Investors?

Angel investors are individuals or groups of local business people who are interested in helping new companies get started. They typically provide money for companies that are close to home since they want to support their communities. In most cases, angels do not give large sums of money, generally they amounts are under $100,000. Angels not only provide money they may also be willing to play an advisory or mentoring role offering their experience and advice in guiding a company.

How do you find an angel?

Angel investors, because they are well respected, well connected, and genuinely interested in seeing you succeed, tend to be sought after. But they are not always easy to find, in most cases they do not want entrepreneurs calling them out of the blue. The best approaches to finding angels include: networking in your community by talking to fellow entrepreneurs, contacting university business and engineering school professors with whom you may be acquainted; and locating business association contacts. In many major Canadian cities angel networks have formed to bring entrepreneurs and investors together. These networks can be located through business associations, local economic development organizations or local technology associations. These networks will typically gather on a periodic basis to review proposals, if they are interested they will invite you to make a presentation.

7.0 Marketing Your Technology

Marketing is an often overlooked but critical part of the technology commercialization process.

A key reason for the failure of many of these endeavours is the lack of adequate research about potential markets and a lack of an effective network for building relationships with potential clients, partners, and adopters.

Even if your technology is first-rate, without a large enough market, it will not be a success. This will often happen with technologies which are so new that there is no clear or wide-spread application.

A good marketing plan is essential to a successful commercialization effort.

Individual entrepreneurs, or those working with smaller companies believe that developing a marketing plan is a difficult undertaking best left to the experts. However the techniques and information content used by experts and large firms are easily accessible from many sources.

There is an extensive literature on marketing and product development that can be tapped into at public libraries, Canada business services centers, and other local business assistance organizations.

The Internet has also become a valuable source of information on all aspects of marketing, with how-to guides, sources of primary market research studies, companies databases, and patent information to name a few.

When should you begin marketing?

Marketing is often seen as an activity to be undertaken late in the commercialization process. Research, however, should begin with the preliminary technology evaluation, before product development begins. And this marketing research should be seen as a continuous process.

As you meet with financial backers, prospective buyers, and others; and as market conditions change, your understanding of potential markets will evolve

Keep in mind that the market you initially envisage for your product may not be the one in which you will have the most success. An ongoing marketing process will allow you to exploit opportunities that you may not have initially envisaged.

There are also significant benefits to building your network of contacts with potential clients and or adopters early on in the process. They will be able to provide you with insights into the challenges facing the sector or industry you are targeting and for which your technology may provide a solution.

7.1 Doing a Marketing Plan

A marketing plan is aimed at getting an idea of the market value, or potential market value, of your technology. This requires gathering information necessary to make a determination about which of several markets has the most potential for success.

Some key questions your market research should answer include:

- Who are your clients?
- Why clients or adopters need your technology?
- What is the size of the market, its growth potential?
- What is the price you could charge?
- Who are the competitors and competitive products?
- Who are your potential partners?
- What new technologies and technology trends that could have an impact on your product/service?

The Steps

If you are in very early stages of technology development, you probably need to do only a preliminary market analysis.

This is meant give you an idea of whether or not to invest in moving the technology to a prototype stage.

If you are beyond the basic technology development stage, you will want to look at doing a full marketing plan as part of your overall business plan.

A marketing plan will help you to systematically define your goals, identify information needs, and collect information to answer the above questions.

There are a number of examples and marketing research guides that are readily available to help you structure your plan. Once you have developed your marketing plan, the next step is to collect the information.

Once you have gathered your information, you have to assess the results. A standard method for doing this is through SWOT – strengths, weaknesses, opportunities and threats. You should evaluate your own technology and your organization for strengths and weaknesses, and then evaluate the external market for opportunities and threats. Marketing guides can lead you through your business environment analysis.

Once you have done your analysis, you can evaluate your business opportunity. The market plan should support your decision investment decision.

7.2 Market Research Sources

If you have done a preliminary technology evaluation, you should have an idea of who your clients are, the size of potential markets, and your competitors.

There are a wealth of secondary sources readily available from your library, over the Internet, and from marketing research organizations.

You may also want to undertake primary research using surveys and focus groups. These may be necessary if you are just starting up.

Keep in mind that primary research does not have to be costly. Focus groups and surveys can be done informally, and on a smaller scale. For instance, meeting and discussing your technology with potential clients at trade shows, conferences, and other venues can yield valuable information. Here are several information gathering strategies used by progressive firms:

Listen to potential customers

Customers often directly state their need for specific product features (e.g., increased corrosion resistance, reduced product weight or size), improved quality, reduced costs, or less maintenance. However, trying to determine what the customer wants is not always simple or straightforward.

This is particularly so in hi-tech fields, where potential customers may not have envisaged the many "new-to-the-world" products being created. Techniques used to identify needs include studying customer complaints, product returns and reports of quality problems. Many firms also "listen" to their competitors' customers to determine what combination of tactics and technologies that would be required to capture their sales.

Monitor the competition

Many firms monitor actual and potential competitors to identify new technologies being used and new products being produced. This experience often leads to "crash" programs, in which firms catch up by deploying equivalent or better technologies and products.

Competitive intelligence is one way to monitor the competition. This includes gathering information through help wanted adds, company Websites, press releases, and current intellectual property filings.

Consider innovation "scanning" programs

Many companies have programs that attempt to seek out relevant innovations, including new technologies and new product lines. They keep up with innovations by communicating with research centres and industry associations, monitoring domestic and international trade shows, web searches, database searches, patent searches, and reviews of domestic and international trade magazines, newsletters, and academic journals.

Firms also monitor foreign markets, new products or technologies that have met with success in foreign or regional markets.

Such knowledge can provide them with a leadership position in their own markets. Your local library, university library, and some federal organizations provide search services.

Using consultants

Companies may elect to undergo an assessment or "diagnosis" of part or all of its operations to determine what improvements are required, to technology employed in its operations and products. Such assessments are frequently performed by consulting engineering firms.

Public technology organizations are also active in performing such assessments or diagnoses in many countries, often using a structured methodology. The results often identify specific operating and product technologies the respective firms need to transfer in and master.

Approaching government organizations such as the Industrial Research Assistance Program, consulting firms, and technology brokers in your area can be useful for finding out about company needs.

Talk to suppliers

Many firms will often turn to existing or potential new suppliers to obtain assistance in identifying new operating or product technologies. Such assistance may be sought for such purposes as solving technical problems, satisfying customer needs, reducing costs, and meeting competitive threats.

7.3 Networking: Identifying and Approaching Potential Clients, Partners or Adopters

One of the best ways to gather information is also the best way to market your technology: meeting with potential customers, partners, and clients.

Once you have identified promising markets, you will want to generate a preliminary list of companies on which to focus more intensive marketing efforts.

A good source of information is your own network of scientists and engineers, and others working in your organization. Through these personal networks, you may be able to find out about colleagues in other organizations who are working in the same area.

There are a large number of databases on key industries/companies, and their fields of activity. Some of this information is available from industrial directories, industrial associations, trade journals, and government directories. Increasingly, much of this information is available on the Internet. Large Websites like the Strategis Canadian Company Capabilities database can give you information or Canadian firms. Search engines like Yahoo and AltaVista will allow you to search for company Websites from across North America.

Another excellent way to develop market leads is to take advantage of government networks, such as the IRAP and CTN programs. These networks are made up of technical experts that work with hundreds of companies a year. They can be valuable source of information on potential clients and markets.

Assessing potential adopters

If you are working in a public sector lab, university, or private company ,and you do not want to commercialize the technology yourself, you will want to license and transfer it to another organization – often called an "adopter".

Technology transfer adopters are firms that take your raw technology and develop and commercialize it further.

If you are looking for a potential adopter, look into companies already developing or marketing products in your target market. They may be interested in improving their product. They may be using similar processes and are interested in improving their manufacturing, testing or R&D. They may be interested in technology that allows them to either fill a gap or expand their product line. And they may be doing research in related areas but do not yet have products in the market.

Questions could include the following:

- Does the technology (existing or still under development) fit the company's need or technology/business strategy?
- What is the company's time frame to develop the product or process?
- How does this relate to the "window of opportunity" for the product or process?
- Does the potential adopter have the financial resources to both develop and successfully market the technology to the end-user?
- Are there any barriers to the adopter and the originator working together? (These may include pressure to publish research results quickly; an uncooperative inventor; lack of appreciation for "on-time and on-budget" by the research staff; poor prior working relationship; the inventor has business ties to a competitor; or the adopter has major ties to another possible source of

technology or expertise)

- Does the potential adopter have a senior-level person designated as a contact point for technology transfer activities?
- Does the potential adopting firm have previous experience in transferring in externally developed technology?

7.4 Promoting Your Technology Product

In general, there are two types of marketing strategy you can use: passive or active.

The passive strategy

Passive – or broad – marketing has the objective of promoting your technology or capabilities to a wide audience.

Methods that can be used include:

- Advertisements in magazines and trade journals.
- Published papers in learned and trade journals.
- News releases or mailings of technical newsletters.
- Website that advertises capabilities and technologies available for transfer.
- Exhibits at trade shows and conferences.
- Hosting symposia and industry open houses.

The active strategy

Active – or targeted – marketing focuses on a limited number of potential adopters who have been previously identified.

When targeting potential adopters, find out who in the organization has been given the responsibility and authority to look for technologies or expertise. In general, if you are trying to transfer a technology that will result in a product, the decisions on whether to adopt the technology are made at a high level in the organization.

After identifying the key individual(s), arrange for personal visits which include your technology transfer team officer. For instance your business manager, ect.

Decisions about adopting a technology that will go into improving a process are more likely to be made by the technical people close to R&D or manufacturing. Telephone calls to identify interested parties, followed by mailings of non-confidential information (e.g., a business opportunity document), followed by invitations to visit your laboratory and meet with key personnel are a good to proceed.

Make marketing part of your culture

While attending conferences, you should, in addition to presenting papers or learning about new advances in your field, be on the alert for technological problems and challenges mentioned by colleagues in industry. Try to make contacts wherever possible.

If you work in a larger organization, your scientific staff should be encouraged to take on the roles of promoting your technologies and identifying opportunities where their expertise can be applied to solving industrial problems.

To ensure that all staff become involved in marketing, consider holding workshops or including marketing awareness as part of other technology transfer training.

Approach or join, along with your staff, industry associations in markets that you have identified. If you have

an environmental technology, it may be useful to find out more about industry associations that have memberships concerned with environmental issues.

Associations will often hold conferences where you can meet and network with industry.

7.5 Using the Internet

Before you even attempt any marketing on the Internet, you need to understand that every component of the Internet (Electronic Mail, World Wide Web, Newsgroups) has its own rules. The best way to learn the do's and don'ts of the Internet is to learn Netiquette (Internet etiquette).

World Wide Web (Web)

The popularity of the Web is growing at a phenomenal rate. People use the Web to communicate, to get information, to do research, to shop and more. The relative low-cost of a Web site compared to other forms of marketing has attracted millions of companies to purchase their own domain name.

Why do you need a Web site?

A Web site will give you the chance to:

- showcase your product or services,
- attract new clients,
- sponsor areas of interest,
- maintain public relations,
- provide customer service 24 hours per day.

How do you set up a Web site?

You need to decide if you want to have a .ca or another type of suffix. The .ca domain suffix will clearly identify your Web site as being Canadian, but it is a bit harder to obtain then a .com, .org or .net suffix. The .ca domain is administered by CA Domain, while the major three suffixes are registered by Network Solutions (formerly Internic).

Another decision you will have to make is to choose between having your Web site done in-house or by an outside company. While you will probably have more control if you decide to keep the design in-house, you need to make sure that your employees have the training to handle the latest technologies. Before hiring a company to design your Web site, ask to see examples of sites it has worked on. A lot of people declare themselves "experts" in Web site design, but provide sites that do not look professional-looking.

You need to a computer to host your site. While some big companies can afford their own servers and a fast internet connection, most SMEs cannot. The solution is to find a find a Web hosting company. Shop around, as the prices and quality will vary greatly. One way to find a fast and reliable hosting company is to ask other people who have web sites if they are satisfied with their service. The Web hosting company will actually do the domain name registration for you.

How do you promote a Web site?

Once your site has been well-designed and is ready for your visitors, you need to promote it. The expression "Build it and they will come" does NOT apply to the Web!

Search Engines and Directories

The most important thing to do to promote your Web site is to submit it to the major search engines and directories (such as Yahoo!, Open Directory Project, AltaVista, Excite, and Lycos). You should do this

manually, rather than using a submission service, as the results will probably be better. While some companies will offer to list your site in more than 500 search engines on the Web, the major Search engines will most likely constitute the majority of the traffic that is sent to you. You should also resubmit your site to search engines if you changed the content and it hasn't been indexed recently.

You should also consider submitting your site to regional search engines (restricted to Canada or Quebec, for example), and specialized search engines, which are restricted to a particular subject.

Banner Advertising

While Radio and Television advertising is quite expensive, Web advertising is not only affordable, but it's also interactive. You can get to know your visitors without even meeting them! However, you should be aware that response rates have been declining since the introduction of banner ads. A "good" click-through rate varies from 0.5% to 1.0%.

Simple, but effective methods

If you have a Web site, let people know! Your URL (Web address) should be listed on:

- Business cards and letterhead.
- Print and display advertising.
- Broadcast advertising like radio and TV.
- Direct mail and brochures.
- Press and publicity releases.

Electronic Mail (E-mail)

E-mail can be a very effective way of promoting your company or your Web site. However, you should NEVER send unsolicited E-mail messages (also know as junk e-mail, bulk e-mail, or spam). While spam costs the sender very little to send, the recipient or the carriers pay for most of the costs, through their phone connections, ISP fees and other indirect ways.

The opposite of unsolicited E-mail is an "opt-in" mailing list. An Opt-in list is a list where the users have asked to receive e-mail messages from your company. You can either send out your own mailing list, or you can buy advertisement in someone else's (this practice is know as "sponsoring" a list). Opt-in mailings usually return a response around 2%, while spam's average response rate is a fraction of one percent.

Newsgroups (Usenet)

Finally, you should also be familiar with newsgroups. Newsgroups are public discussion areas, free and open to anyone with an Internet connection. Usually focused on surprisingly specific topics, newsgroups are where the curious, opinionated, or info-starved go to read and post messages.

Once you have identified a few newsgroups that are relevant to your industry or technology, you should read them regularly. This will give you the chance to provide answers to other users (thus, raising the profile of your site) and monitor the activities of your competitors.

Newsgroups users can sometimes be particularly harsh with people not familiar with Usenet Netiquette. If you don't want to be "flamed", you should at least respect the following rules:

- DO NOT advertise in newsgroups.

- DO NOT cross-post to many newsgroups (no more than three or four).
- DO NOT post to irrelevant newsgroups.
- DO NOT post until you have read the F.A.Q. for the newsgroup.

7.6 Technology Marketing: The Do's and Don'ts

Do's

- Identify clearly the products/services to transfer, and the potential markets, in your marketing plan.
- Consider for your technology transfer only firms with the technical capability to further develop the product for the market.
- Use of third-party technology assistance programs to identify the technological needs of small and medium-sized companies (e.g. IRAP).
- Ensure that technology transfer champions in both the originating and adopter organizations are identified and supported.
- Use targeted or highly focussed marketing procedures to identify and approach prospective adopters or clients.
- Use market studies to identify technical problems in, or technological needs of, potential client industries, or individual firms.
- Identify the key decision makers in the prospective adopting firm and forcus marketing efforts on them.
- Ensure that adequate funding is made available to support travel to industrial sites and conferences, and for sabbatical leaves in industry.
- Use checklists to ensure that all of the important issues concerning the technology and the transfer process have been considered.
- Use general communications mechanisms (trade journals, articles, newsletters, Websites) to ensure that prospective clients of the originating laboratory's technologies/expertise are aware of their existence and their willingness to work with companies.
- Ensure that potential adopters are advised clearly of the originators policies regarding the ownership/licensing of intellectual property rights.
- Ensure that adopters are assigned exclusive or sole proprietary rights to the intellectual property where desired by the company, in order to encourage additional investment in the technology development and marketing.
- Invite industrial experts to the laboratory to identify possible areas of technology/knowledge transfer; ensure that up-front fees or royalties are deferred, especially for small adopting firms.

Don'ts

- Oversell the technology and imply that it is further down the development path than it really is.
- Underestimate the additional contribution that the adopter must make in order to bring the technology to market or to adapt the technology to their processes for internal use.

- Restrict your marketing efforts to local companies.
- Restrict your marketing efforts to those companies that use the technology in its present configuration.
- Forget to approach companies that might benefit from the technology in different applications.

8.0 Protecting Intellectual Property

When to protect your intellectual property?

Intellectual property (IP) protection should be a major consideration from the very earliest stages of your technology commercialization activities.

You should be fully aware of your rights and the pros and cons of formal IP protection before you disclose your idea or invention with any firm or audience.

Many inventors disclose their inventions without even knowing that they have done so. Keep in mind that if you discuss an idea, make a presentation at a conference, or give descriptive documents to a potential client, you may have made a public disclosure. This means that you will weaken or lose your claim to the intellectual property if you have not filed for patent or other form of intellectual property protection.

If you work within a university, government, or larger corporate context, your organization probably has a disclosure process in place. If you do not have access to internal expertise, a good patent lawyer or agent will be able to advise you on this process.

Should you always file for intellectual property protection?

Intellectual property protection provides you, as the owner of the IP, the right to prevent others from using your technology or idea for a given period of time. However, thought has to be given to whether you want to formally protect a technology at all, since this will require full disclosure of the details about your invention including diagrams.

It may be more effective protection to keep your idea under wraps, to prevent others from using what you have disclosed to invent around your patent.

How do you find out if your invention is unique?

Before you begin the commercialization of your technology you should undertake to have a patent or "prior art" search in Canada and in the United States.

This will help you discover if there are registered patents or other forms of intellectual property which may conflict with your patent application and technology development.

Legal actions for infringement on other patent rights usually do not occur until the product is on the market and the inventors have invested significant amounts of time and effort in the product.

There are four types of intellectual property that you will wish to avail yourself of:

- Patents
- Trade Mark
- Copyright
- Industrial Design

There is also protection in Canada for trade secrets. Fuller descriptions of these forms, and guides to their use, are found on the Canadian Intellectual Property Office Website, as well as other sites available through the toolbox search.

You can also access the legislation relating to all forms of intellectual property.

8.1 Patents

When and where to file a patent

You should file for a patent as soon as possible after completing your invention.

Most countries, except the United States, operate under a "first-to-file" patent system. This means that if two or more applications for a patent for the same invention have been filed, the patent will be granted to the first applicant.

The United States has a "first-to-invent" patent system. If two or more applications for the same invention have been filed, the patent will be granted to the inventor who is able to prove the earliest date of invention, regardless of the date of filing the patent application.

Under NAFTA, Canadian and Mexican inventors can establish a date of invention based on work done in either Canada or Mexico on, or subsequent to, 1 January 1994.

If the invention date is before 1 January 1994, a date of invention can openly be established for either work done in the United States or, if the work was done outside the United States, the date of introduction of the invention into the United States.

Under the GATT Uruguay Rounds, inventors in any World Trade Organization (WTO) country can, with some provisos, establish an invention date for work done in a WTO country on or after 1 January 1996.

Filing a patent internationally

If you want to have your invention protected in other countries, you must file for a patent in each of the countries in which you want protection.

Under the Paris Convention of 1887, all applications for a patent filed in a member state for a specific invention are accorded the same effective filing date as the first filed application, provided that the foreign applications for the invention are filed within one year of the filing date in the first member state.

In Europe, you can file a single application (in English, French, or German) to the European Patent Office to protect one's rights in up to 18 European countries. A single regional patent may be granted, but it is not effective until it is ratified in each national patent office selected by the applicant by paying the appropriate national fees, translating the application into the local language, and meeting local requirements as to form of claims, etc.

You may wish to file a patent in the United States since it is a significant market for new technologies and the cost of filing is comparable to filing a Canadian patent.

The cost of filing a patent

The cost of filing a patent in Canada includes the cost of preparing and filing a patent application, various prosecution costs, and the issue fee.

After the patent has been issued, keeping the patent enforced requires paying maintenance fees after specific time periods for up to 20 years. Many of the fees are discounted for applicants who qualify as small entities (generally, all individuals and organizations, except for-profit businesses, with 250 or fewer

employees).

The filing fee, depending on the number of claims in the application, runs anywhere from $150-$300.

For most applicants, the main cost item in the patent application is the professional charges by the patent attorney or agent preparing the patent application.

A patent application for a very simple and easy-to-describe technology can cost the applicant as little as $2,000.

Other inventions, especially those that are very complicated or have substantial electronic or software content, can cost as much as $8,000 to $10,000 to be filed.

These costs may seem quite high. However, patents are only intended to protect commercially useful inventions. Furthermore, patent costs are generally small compared to the costs of turning an invention into a product, and then marketing and selling the product.

If you do not have good reason to believe that the profits from the invention will greatly exceed the costs of getting the patent, you probably should not be patenting the invention.

Fees for patent application in Canada

- Filing a patent: $150 - $300
- Request for patent examination: $200 - $400
- Grant of application: $150 - $300
- Maintenance fees for patents in effect: $100 - $400

Filing a provisional patent

Provisional patents are essentially express patent filing services. They afford some protection for your invention within a few days of the request, and give you up to a year to file a more formal patent application. The advantage of a provisional patent is the speed of the turn around and the additional time that it affords the inventor.

8.2 Prior Art Searching: Determining If You Have a Patentable Invention

You will have to determine if your invention can be patented.

An invention can be patented if it meets all three of the following criteria:

- It must be novel (first in the world).
- It must be useful (functional and operative).
- It must show inventive ingenuity and not be obvious to someone skilled in that field.

The invention can be a product, a composition, an apparatus, a process, or an improvement on any of these. A patent is granted only for the physical embodiment of an idea, or a process that produces something saleable or tangible. Scientific principles, abstract theorems, ideas, or a method of doing business cannot be patented.

How do you determine if your invention meets the criteria?

In order to meet the three criteria listed above, you or a patent agent or a patent search organization will have to undertake a prior art search. It should not be assumed that because a product is not on the market, that it is new or has not been patented. Therefore, before spending a great deal of time or money on commercial feasibility studies, a prior art search should be conducted. Ideally, this should be done by a patent agent or lawyer.

A search could show if your invention or a variation of it:

- Has already been patented. If a current patent claims any part of you invention, the owner of the patent has exclusive rights until it expires.
- Is already in the public domain, either through an expired patent or through prior publication.
- Is not covered by any current or expired patents.

A prior art search also has some other benefits when it comes to market research. It may assist you in:

- Discovering research ideas and solving problems with your own technology.
- Monitoring the activities of potential competitors or partners.
- Predicting new areas of research that may impact on your technology efforts.
- Uncovering new market players.
- Identifying patents owned and licensed by firms.

Listings of Patent Lawyers and brokers who can undertake searches are easy to find. The Patent and Trademark Institute of Canada will provide you with a list of patent agents. The Canadian Intellectual Property Office also maintains a list of registered Patent agents. Provincial Research Organizations in most major metropolitan centres will also do patent searches.

As well, many university libraries will do patent searches for a fee. These organizations will have access to high-cost information sources that will improve the quality and thoroughness of your search.

According to PATSCAN, when it is important to achieve the best possible search results, professionals turn to the database providers Knight-Ridder (DIALOG), STN, Lexis-Nexis, and Questel-Orbit, who provide a wide variety of intellectual property databases, covering many countries and subject areas.

Are there sources available to do it yourself?

There are many free Internet-based information systems that will allow you to search for patents. These include the Canadian Intellectual Property Office database and the IBM patent database in the US.

There are other comprehensive sources which allow for searches of European systems as well.

You should probably have an understanding of the International Patent Classification system. The Classification is indispensable for the retrieval of patent documents in the search for "prior art" because all countries use this system and it provides an internationally agreed upon set of classifications. Most of the databases are free text and can be searched easily.

8.3 Copyright

What is Copyright?

Copyright protection provides you as the owner the sole right to produce or reproduce all or part of a work in any material form. Any original literary, dramatic, musical or artistic work qualifies for copyright protection. For the purposes of commercializing new technologies, copyright is used in protecting software code.

As the owner of copyright, you also have the sole right to authorize the use of any of these rights. You have the right to keep all of these rights, assign some or all of these rights to another party (transfer ownership), or license some or all of these rights to another party.

How do you acquire copyright protection?

In Canada, copyright protection arises automatically provided that the work is original and:

- You are a citizen of Canada or other qualifying country.
- The first publication occurred in Canada or in a qualifying country.

Most industrialized countries are qualifying foreign countries.

How long does copyright last?

Copyright lasts 50 years from the end of the author's lifetime. Although, in practical terms, this is not an issue for software; suffice it to say that the copyright on your invention will last as long as the software.

8.4 Industrial Designs

What is an industrial design?

Industrial designs are the original design elements of your technology including the shape, pattern or ornamentation. Industrial design registration provides protection for these unique design elements but does not protect the functional elements of your new technology. In many cases the function elements will be the subject matter for a patent.

How do you Protect an Industrial Design?

You protect an industrial design by registering it with the Canadian Intellectual Property Office.

What is a Trade Secret?

A trade secret is almost any information used in the development or manufacture of a product, or embedded in the product, that gives a competitive edge and can be kept secret.

How do you protect a Trade Secret?

It is difficult to protect a trade secret through legal channels as you must demonstrate that it was not independently created or the result of "reverse engineering". You must be able to show that the trade secret was acquired either by industrial espionage; or through a former partner, employee, etc. who had agreed to not disclose your trade secrets.

It is always wise to be cautious when you are revealing your trade secrets to new partners or employees and to make sure that they have signed a non-disclosure agreement or some other contract. By the same token, caution should be exercised with new employees who may inadvertently reveal a trade secret from a previous employer.

8.5 Integrated Circuit Topographies

Integrated Circuit Topographies

Integrated circuit topographies are manufactured devices made up of layers of semiconductors, metals, insulators and other materials. The three-dimensional view of these layers is a "topography". The original topography design is protected under Canada's Integrated Circuit Topography Act. The Act gives you, as the owner of a registered topography, rights to restrict reproduction, manufacture and import.

How do you protect an Integrated Circuit Topography?

Unlike copyright protection in Canada, protection for integrated circuit topographies is not automatic. To obtain protection; a topography must be registered with Canadian Intellectual Property Office. The Act protects registered topographies for a period of up to ten years, commencing on the filing date of the application. Topographies, whether registered or not, are transferable through a licence or some other vehicle.

8.6 Confidentiality: Protecting Your Intellectual Property Before You Have Protection

As you go through the initial stages of commercialization, you may find it necessary to disclose to prospective partners, receptors or clients, details about your invention before you have intellectual property protection.

Disclosing your technology prematurely may mean that you can no longer protect your intellectual property. In the worst case, someone else may be able to patent you invention and prevent you from using it.

A confidentiality or non-disclosure agreement can be a valuable tool at these early stages. This will require that other parties not disclose or utilize your intellectual property. Larger organizations, universities, public labs, and companies will usually have an invention disclosure process in place for this situation.

Public disclosure is deemed to have occurred in the following situations:

- Information about the invention has been told to someone who is not constrained by a non-disclosure agreement.
- An oral presentation at a public meeting or conference.
- Any printed publication in a newspaper, scientific journal, conference proceedings, etc.
- Published pre-prints or abstracts of papers for a scientific meeting or a thesis.
- Public defence of a thesis.
- Publications or flyers/brochures advertising the technology for sale.
- A photocopy of a handwritten document.
- Information distributed to a bulletin board or "chat-line" on the Internet.

In some countries, experimental use of the invention in public will make obtaining a patent much more difficult, if not impossible.

Research grant applications which contain descriptions of the proposed invention, while not considered public disclosure in Canada, may be considered public disclosure in other countries. As in the case of a thesis defence, you may wish to have the information recipients sign a non-disclosure agreement in order to maintain patentability.

Disclosure of an invention, using an employer's invention disclosure form, is not considered public disclosure as the recipients in the technology transfer office are considered as holding the information in confidence.